# Atmosphere Tolerant Acquisition, Tracking and Pointing Subsystem

Shinhak Lee and Gerardo G. Ortiz
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, CA 91109

**ABSTRACT**

For high rate communications such as optical communications, tracking loss can result in substantial reduction of average data rate and the total data volume of the transmitted data. For optical communications, which transmits laser beam through atmosphere, atmospheric induced fading of the beacon signal can vary more than 10dB as observed from the past ground to ground optical experiments. In this paper, we propose a new scheme of compensating the atmospheric induced fading effects using inertial sensors. By measuring the platform vibrations, the beacon movements on the Focal Plane Array (FPA) can be deduced even if the beacon is lost (due to fading). By avoiding the new cycle of reacquisition and tracking, high rate communication can be maintained. The allowable period of beacon fade depends on the inertial sensor noise characteristics and acquisition and tracking Field-Of-View (FOV). We will present the results of our analysis using several commercially available inertial sensors and two previously planned missions, UAV-to-Ground and ISS-to-Ground optical communications experiments.

**Keywords**: Optical communications, Acquisition, tracking, Pointing, Atmosphere, Fade